

INFECTIOUS DISEASES

Disease and the Immune System

An infectious or communicable disease is one that can be transmitted from person to person, from an infected animal or from the environment to the person. Illness results when the bacteria, viruses or other agents invade and multiply in the host (the person's body) and as a result cause specific diseases. Illness and the development of resulting disease depend primarily on the bacteria, virus or other agents and on the reaction of the body's immune system. Basically, bacteria or viruses can invade the body without causing the signs and symptoms of disease if the body's immune system responds adequately. Only when the bacteria or virus overpower the immune system do the signs and symptoms of disease develop.

When bacteria enter the body, they attack normal cells by secreting toxins that damage or kill the cells and by competing with the cells for nutrients. Bacteria are self-contained, living cells that reproduce rapidly if not checked by the immune system or appropriate medication. Viruses are not capable of reproducing until they have entered a host cell. The virus has a protective outer coating that enables it to bind securely to host cells; once the virus has penetrated the cell's lining, the coating dissolves, allowing the virus to alter cellular function as it attacks from inside the cell. When the cell regenerates itself, it reproduces a cell that has been genetically altered by the virus.

Obviously, the immune system has to fight bacteria and viruses in two different ways. With a bacterial infection, the body's B-lymphocytes recognize the bacteria and produce antibodies-proteins that search out and kill the bacteria. B-lymphocytes can fulfill the same immune response to viruses only while the viruses are still free floating in the bloodstream. Once a virus invades a cell, the B-lymphocytes become ineffective. To kill the virus, they also have to kill the body's own cell that is serving as host. Because the B-lymphocytes are incapable of this type of action, the immune system calls up its second line of defense - the T-lymphocytes, which can identify and destroy cells occupied by viruses.

The function of the immune system and its production of antibodies is what enables researchers to identify disease. If study of a patient's blood shows that antibodies to a certain illness are present, the physician can be certain that the patient has either been exposed to the illness or developed it.

Transmission of Disease

The spread of disease depends on the ability of the infecting organism to survive outside its source. A source may be an infected person, an animal, an insect or even an inert object. Transmission also depends on the ability of the infecting organism to move from one place to another. There are four general routes of transmission:

1. **Contact transmission** is the most common mode for infection disease. Simply stated, an infected person comes into contact with a non-infected person and transmits the disease. Contact transmission can be either direct or indirect. Direct transmission involves direct physical contact between two people. A person may touch the weeping lesions of chickenpox, for example, and become infected. Direct transmission also involves droplet contact, where sneezing, coughing or talking contaminates the air with droplets. Cold and flu viruses are most commonly spread by droplet contact. Even with droplet contact, the contact must be direct, since droplets generally do not travel more than 12 feet from the source. Indirect transmission occurs when an infected person spreads the infection to an inanimate object, and a non-infected person touches or otherwise comes into contact with the infected object. Equipment and instruments often spread disease as can soil, air, insects, food, milk and water.
2. **Airborne transmission** is much like droplet contact but it is more diffused. Droplets that are sneezed, coughed or otherwise sprayed into the air evaporate but the residue remains in the air for long periods of time. Airborne dust particles pick up some of these bacteria or other disease causing organisms and air currents help to

spread them over a wide area. The disease-causing organisms then are inhaled by or come to rest on a susceptible person who is subsequently infected.

3. **Vehicle transmission** is when the infective agents are introduced directly by a "vehicle" or something that carries the infective agent. A person may drink contaminated water or may eat contaminated food or it also could occur as a result of the injection of contaminated blood or contaminated drugs.
4. **Vector transmission** occurs when an animal provides the route of transmission to a person such as an infected tick causing Rocky Mountain spotted fever or an infected mosquito transmitting malaria.

Human Immunodeficiency Virus (HIV)

One of the most terrifying and difficult infectious diseases currently posing a health hazard is acquired immunodeficiency syndrome, or AIDS. This disease is commonly referred to as Human Immunodeficiency Virus or HIV. The first isolated cases were reported among previously healthy young homosexual men in 1981. Within a few years, the disease had spread globally.

Unfortunately, it is extremely difficult to get an accurate picture of the HIV situation. The incubation period is unknown but may be as long as 10 years, so researchers say that millions of Americans may be infected without knowing it and, therefore, may be spreading the disease in alarming proportions. In fact, researchers estimate that for every diagnosed case of HIV, there are at least 50 undiagnosed Americans with the disease.

What is AIDS or HIV?

AIDS (or HIV) is a disease that renders the immune system ineffective. The AIDS virus enters the body and affects the immune system's T-lymphocytes. As discussed earlier, the T-lymphocytes identify and destroy cells that are occupied by viruses.

There are actually two types of T-lymphocytes.

- The "Helper" T-lymphocytes stimulate the immune system to combat disease.

- The "Suppressor" T-lymphocytes tell the immune system to shut down when its work no longer is needed.

In the normal body, there are about twice as many helper T-lymphocytes as suppressor T-lymphocytes. The AIDS virus kills the helper T-lymphocytes and renders the remaining ones ineffective. The body no longer can recognize and respond to foreign cells, like viruses and cancer cells, and as a result no longer can fight disease.

There are four categories in which a person that tests positive for HIV can be diagnosed.

1. Asymptomatic HIV Infection occurs when an individual tests positive for HIV but does not present any symptoms of opportunistic non-life threatening or life threatening infections.
2. Symptomatic HIV Infection occurs when an individual tests positive for HIV and presents symptoms of opportunistic infections not considered life threatening. Symptoms can include fever over 100 degrees, night sweats, weight loss of greater than 10 percent or 15 pounds, persistent diarrhea, debilitating fatigue and persistent lymph gland problems. These symptoms must last longer than three weeks and be accompanied by laboratory confirmation of a number of abnormalities, including a reduced number of T-lymphocytes and an abnormal helper/suppressor T-lymphocyte ratio.
3. Severe Immune Depression occurs when an individual tests positive for HIV and presents with a T-cell count below 200.
4. AIDS occurs when an individual tests positive for HIV and presents symptoms of opportunistic infections considered life threatening. These infections usually do not occur among people with healthy immune systems or produce a very mild illness when the immune system is functioning as it should. These infections often include various forms of pneumonia and/or cancer.

Transmission

HIV can be transmitted by a person who is ill with AIDS and asymptomatic HIV. The virus is extremely fragile and unable to survive very long outside the human body, so it cannot be

transmitted casually. Researchers have confirmed that the only way HIV can be transmitted is by intimate contact with the body fluids of an infected individual even though the infected individual may not have any symptoms. Body fluids include blood, semen, vaginal secretions and breast milk.

While HIV has been found in saliva, there have been no documented cases of the disease being passed solely through kissing. HIV cannot be transmitted by shaking hands, coughing, sneezing, sharing meals, sharing eating utensils or any other casual contact. You cannot get HIV from toilet seats, towels, office equipment or any other object casually handled by infected persons.

More than two-thirds of individuals infected with HIV in the United States are believed to have acquired the virus through sexual contact. Studies show that both men and women can transmit HIV to their partners, although female-to-male transmission is much less common in this country. The chances of becoming infected with HIV become greater the more sexual partners a person has.

Use of an infected needle is also a major source of infection. Those who most often share needles, such as intravenous drug users and athletes who inject steroids, are at highest risk.

Tattooing also may have caused an infection, and some cases, may have occurred in poverty-stricken areas where needles are reused for medical or immunization purposes.

Prior to 1985, blood donated by infected persons was passed to non-infected persons, causing transmission of HIV. Particularly at risk were hemophiliacs who, because of their increased needs, must receive donated plasma that is pooled from as many as several thousand donors at a time. Others receiving blood transfusions following surgery or trauma also became infected. Since 1985, donated blood has been carefully screened to prevent infected blood from being given in hospitals or other settings. In addition, blood used for hemophiliacs is heated - treated to destroy HIV.

Not everyone infected by HIV will develop AIDS, but they still are capable of transmitting the virus to others regardless of whether they themselves have signs or symptoms.

Commitment to Safety

Every Guam Fire Department EMS provider is committed to safety and a consciousness about the transmission of disease. They work with an attitude of protecting both themselves and the public.

While working with a patient, EMT's wear latex gloves, eye protection and masks. After each patient, the linen always is changed on the gurneys and the equipment is disinfected. Hypodermic needles always are disposed of in a Sharps container, which is a rigid-walled puncture-resistant container.